

REMARKS

The Examiner is thanked for the Official Action mailed January 03, 2005. This Response is intended to be fully responsive thereto.

Claims 15, 11-13 and 17-10 were rejected under 35 U.S.C. 103(a) as being unpatentable over Norichika (JP07006867) in view of Sandberg et al (6,288,732). Claim 7 was rejected under 35 U.S.C. 103(a) as being unpatentable over Norichika in view of Sandberg and further in view of Mackta (5,912,811). Claims 6 and 14 were rejected under 35 U.S.C. 103(a) as being unpatentable over Norichika in View of Sandberg and further in view of Gerrard (6,310,332). Claims 9 and 15 were rejected under 35 U.S.C. 103(a) as being unpatentable over Norichika in view of Sandberg and further in view of Horn et al (6,737,610). Claims 10 and 15 were rejected under 35 U.S.C. 103(a) as being unpatentable over Norichika in view of Sandberg and further in view of Chiles et al (6,300,598).

These rejections are respectfully traversed in view of the remarks that follow.

Norichika (JP07006867) describes melting type insulating heating wire, which consists of at least 3 layers of conductors, sandwiched between at least 3 layers of insulation. To prevent abnormal overheating: (a) the resistance conductor detects abnormal temperature and (b) an internal insulator melts at the abnormal heating temperature and (c) NTC semiconductor detects preset heating temperature.

The proposed invention describes very bulky and complex wires requiring 3 layers of insulation and 3 sets of wires, connected to different lead wires.. Due to bulkiness, stiffness and cost of such wires, many applications are not feasible. For example, electrical mattress pads cannot be made of a thick bulky wire. The applicants' invention allows to reduce one layer of insulation and one layer conductor, which allow this product for many applications..

The current leakage wire (5) of Norichika's invention is connected to a control circuit measuring the current leakage signal. The current leakage is created by overheating of NTC layer and making it semi-conductive in a local spot. In order to allow the weak NTC current leakage measurement, the controller is designed in such way that some of its operational cycles work for heating and some work for current leakage measurement. The measurement cycle can vary from 5% to up to 50% of the total power cycle. Thus, the heating efficiency of the heater will be decreased due to reduction of the time dedicated to the heating cycle. Another disadvantage of Norichika invention is dependence on the length of the sensing conductor. The current leakage signal is usually very weak (due to high electrical resistance of NTC semiconductors) and the leakage conductor wires have their own electrical resistance tolerance. Therefore, the quality of the leakage signal depends on the length of the heating cables and location of the hot spot in it. For example, electrical heating blankets have length of the heating wires of up to 100ft. However, the overheating spot in such blanket can be created only in the area having several inches of the wire, creating extremely low current leakage signal through the NTC layer. The numerous experiences in the industry demonstrated that if the leakage is generated in the middle of the long NTC heating/sensing wires, the control systems are unable to detect the weak current leakage signal, which is in the range of performance tolerance of electronic components and electrical resistance tolerance of the sensing wires. This significantly limits the Norichika's invention application.

The applicants agree with the Examiner that the Norichika invention does not teach use of current imbalance to simultaneously detect hot spots and/or mechanical intrusion.

Sandberg (6,288,372), describes a self-regulating heating cable, which includes a braidless ground return layer, surrounding an inner jacket of the heater. The ground return layer is formed by a conductive polymer and a ground return wire which is connected to the conductive polymer. The polymer may be used for ground fault detection by addition of a particulate conductive fillers.

The Examiner references the "prior art" of Sandberg's invention (FIG.3), describing Ground Fault Protection Devices ("GFPD")(32) to sense current imbalance flowing between Live end (12) and Neutral end (14) of the electrical circuit, which could generate hot spot. However, both the "prior art" and Sandberg's invention describe the temperature "self-regulating" wires, which cannot generate the hot spots by default. The so-called "PTC" (Positive Temperature Coefficient) polymer prevents any hot spots between Live (12) and Neutral (14) ends of the wires by automatic reducing of electrical conductivity (in other words, increasing of electrical resistance) with increase of the normal operating heating temperature of the self-regulating cable.

Sandberg describes GFPD for detecting various mechanical faults for "whatever the reason of the fault" (Col 3, lines 20), but he neither teaches nor anticipates that the GFPD can detect the hot spot, since self-regulating wires never allow hot spots. The use of GFPD to detect irreversable mechanical defects or intrusions is a common knowledge in the industry and neither Sandberg, nor applicants invented the use of GFPD for such mechanical fault detection. The GFPD always trips when the original structure of the cable is mechanically severed or damaged, so it requires the outside repair (if possible) or rejecting of the heating cable.

There are some conventional heating cables which do not have temperature self-limiting or NTC properties. The insulation of these heating cables can be damaged by high temperature (hot spot) due to melting of the insulating polymers. In that case the heater and the ground wires can touch each other, which would cause activation of GFPD and terminating of the electrical circuit. After the GFPD terminates the current in the heater, the heating cable cools down. The position of the ground and heater wires, touching each other, will remain unchanged (due to solidifying of melted plastic while its cooling cycle), leaving the heating system inoperable even if someone will try to re-set GFPD. Therefore, GFPD is always used to detect irrevercible mechanical change or damage of the heating system.

The main novelty of the applicants' invention is utilizing of NTC layer to "simulate" a mechanical damage and short circuit between the heater and the ground wire without actual physical damaging of the insulation. In the event of a hot spot occurrence, the NTC layer allows some current leakage, causing current imbalance in GFPD (also called as "Ground Fault Circuit Interrupter" or "GFCI") while retaining the whole original structural integrity of the cable insulation. This allows for a long term use of the heater with GFPD control systems that can terminate the current, preventing increase of the temperature at the hot spot. Once the hot spot is eliminated or the systems cools down during the OFF cycle, the heating cable and GFPD can be reactivated again for normal heating operation. The applicants propose to alternate the GFPD/GFCI system to allow cycling (ON and OFF) and maintaining the maximum temperature of the heater having current imbalance and further automatic resetting of the system for further operation.

However, the same system, proposed by applicants will shut down the operation of the cable permanently if the real mechanical damage or short circuit occurs. Thus, another novelty of the applicants' invention is utilizing of only one detection method (current imbalance) and only one device: GFCI (GFPD) for control of destructive (mechanical faults) and nondestructive (hot spot) abnormal performance of heating element. The NTC insulation layer serves as simulation means for hot spot detection. None of previous inventions offered NTC/GFCI combination, which provides, safety, performance synergy and product simplicity. Thus, the simultaneous hot spot and mechanical intrusion detection by the use of NTC layer and current imbalance is novel and therefore patentable.

The applicants disagree with Examiner's statement regarding claim 13 that "it would be obvious to make the hot spot current leakage limiting setting lower than a mechanical intrusion current leakage limiting setting, because the current leakage may occur more often than the mechanical intrusion". The applicants propose using of flexible heating cables for various products, such as heating blankets, where cables can be mechanically damaged many times by

folding and bunching even without creating hot spots. The applicants' invention can be used for flooring cables which can be easily mechanically damaged during installation, while it is quite difficult to overheat them under the tiles. Therefore, it is not obvious to pre-set the controller to anticipate the current leakage to "occur more often than mechanical intrusion".

With regard to the rejection on the basis of considering Norichika (JP07006867) in view of Sandberg et al (6,288,732), it is a well known that in order for any prior art references themselves to be validly combined for use in a prior art §103 rejection; the references themselves (or some other prior art) must suggest that they be combined. E.g., as was stated in In re Sernaker, 217 U.S.P.Q. 1, 6 (C.A.F.C. 1983):

"[P]rior art references in combination do not make an invention obvious unless something in prior art references would suggest the advantage to be derived from combining their teachings"

That the suggestion to combine the references should not come from applicant was forcefully stated in Orthopedic Equipment Co. v. United States, 217 U.S.P.Q. 193, 199 (CAFC 1983):

"It is wrong to use the patent in suit [here patent application] as a guide through the maze of prior art references, combining the right references in the right way to achieve the result of the claims in suit [here the claims pending]. Monday morning quarterbacking is quite improper when resolving the question of nonobviousness in a court of law [here the PTO].

As was further stated in Uniroyal, Inc. v. Rudkin-Wiley Corp., 5 U.S.P.Q.2d 1434 (C.A.F.C. 1988), "[w]here prior-art references require selective combination by court to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself. ...*Something in the prior art must suggest the desirability and thus the obviousness of making the combination.*" [Emphasis supplied.]

In line with these decisions, recently the Board stated in ex parte Levengood, 28 U.S.P.Q. 2d 1300 (P.T.O.B.A & I, 1993):

"In order to establish a *prima facie* case of obviousness, it is necessary for the examiner to present *evidence*, preferably in the form of some teaching, suggestion, incentive or inference in the applied prior art, or in the form of generally available knowledge, that one having ordinary skills in the art *would have been led* to combine the relevant teachings of the, applied references in the proposed manner to arrive at the claimed invention. ...That which is within the capabilities of one skilled in the art is not synonymous with obvious. That one can *reconstruct* and/or explain the theoretical mechanism of an invention by means of logic and sound scientific reasoning does not afford the basis for an obviousness conclusion unless that logic and reasoning also supplies sufficient impetus to have led one of ordinary skill in the art to combine the teachings of the references to make the claimed invention. ...Our reviewing courts have often advised the Patent and Trademark Office that it can satisfy the burden of establishing a *prima facie* case of obviousness only by showing some objective teaching in either the prior art, or knowledge generally available to one of ordinary skills in the art, that 'would lead' that individual 'to combine the relevant teachings of the references.' ...Accordingly, an examiner cannot establish obviousness by locating references which describe various aspects of a patent applicant's invention without also providing evidence of the motivating force which would impel one skilled in the art to do what the patent applicant has done."

In the present case, there is no reason given in the Office Action to support the proposed combination, other than the statement "It would have been obvious to one having ordinary skill in the art to modify Norichika's heater and the method of protection to include a GFPD controller to

measure the imbalance of electrical current flowing between neutral ends 12 and 14 as taught by Sandberg in order to protect from hot spot that could cause damage to the heater”

However, the fact that both references teach construction of a heating element and a controller and that the applicants’ invention utilizes materials, which the Examiner thought were similar to those mentioned by references, but which in fact are not similar to them, is not sufficient to gratuitously and selectively substitute parts of one reference for a part of another reference, in order to meet applicants’ novel claimed use of similarly named materials and devices. Moreover, the combination proposed by the Office Action would not result, for the reasons described above, in any kind of a usable heating/sensing system.

The applicants submit that the fact that their invention produces significant advantages over any prior art militates in favor of applicants’ because it proves that even if there was a combination, it would produce new and unexpected results and, hence, would be unobvious.

As stated in the above Levengood case,

“That one can *reconstruct* and/or explain the theoretical mechanism of an invention by means of logic and sound scientific reasoning does not afford the basis for an obviousness conclusion unless that logic and reasoning also supplies sufficient impetus to have led one of ordinary skill in the art to combine the teachings of the references to make the claimed invention. ...Accordingly, an examiner cannot establish obviousness by locating references which describe various aspects of a patent applicant's invention without also providing evidence of the motivating force which would impel one skilled in the art to do what the patent applicant has done.”

The applicants therefore submit that combining Norichika and Sanberg is not legally justified and is, therefore, improper. Thus, they submit that the rejection based on these references is also improper and should be withdrawn.

The applicants respectfully request, if the claims 1-5, 11-13 and 17-19 are again rejected upon any combination of references, that the Examiner includes an explanation, in accordance with M.P.E.P §706.02, Ex parte Clapp, 27 U.S.P.Q. 972 (P.O.B.A 1985), and Ex parte Levengood, supra, a "factual basis to support his conclusion that it would have been obvious" to make the combination.

Mackta (5,912,281) describes a device and method for reducing low frequency electromagnetic fields (EMF) in an electrical blanket (12). The device includes an input, a rectifier filter, and a pair of closely spaced resistance wires (18) and (20). The rectifier filter provides a filtered DC signal to apply across a paired resistance wires.

The applicants did not invent the common nature's fact that closely spaced wires, having some Alternative Current (AC) fluctuation, can minimize or cancel electromagnetic field (EMF) emission. Mackta also did not invent this matter in his invention. Both patents describe completely different constructions of heating elements, methods and control devices. The applicants' invention proposes to have one resistance wire and one lead wire imbedded in the same cable construction to offset the EMF field caused by AC current. The applicants also propose to add additional EMF shield in the form of metal braiding or metal foil. However, all this constructional additives, such as second return wire, EMF metal shields are only optional construction designs which were added in the dependent claims of the invention to describe different construction alternative of the cable having NTC function and connected to leakage imbalance system for fault detection.

The combination of proposed by the Office Action inventions of Norichika in view of Sandberg and further in view of Makta would not result, for the reasons described above, in any kind of a usable heating element and simultaneous hot spot and mechanical fault detection device.

The applicants submit that the fact that their invention produces significant advantages over any prior art militates in favor of applicant's because it proves that even if there was a combination, it would produce new and unexpected results and, hence, would be unobvious.

The applicants therefore submit that combining Norichika, Sanberg and Mackta is not legally justified and is, therefore, improper. Thus they submit that the rejection based on these references is also improper and should be withdrawn.

The applicants respectfully request, if the claim 7 is again rejected upon any combination of references, that the Examiner include an explanation, in accordance with M.P.E.P §706.02, Ex parte Clapp, 27 U.S.P.Q. 972 (P.O.B.A 1985), and Ex parte Levengood, supra, a "factual basis to support his conclusion that it would have been obvious" to make the combination or modification.

Gerrard (6,31,332) describes an electrically heating blanket comprising PTC sensing and detecting means. The Gerrard's heating element comprises PTC sensing wire as a inseparable functional part of his invention. The Gerrards invention does not teach how to use combination of current leakage imbalance, PTC wire and NTC layer for simultaneous detection of hot spot or mechanical intrusion. The applicants however, propose that PTC function of the current leakage detection wire may be only optional, therefore they describe its function in a separate dependent claim of the invention.

The combination of proposed by the Office Action inventions of Norichika in view of Sandberg and further in view of Gerrard would not result, for the reasons and referred court cases described above, in any kind of a usable heating system, having simultaneous hot spot and mechanical fault detection function.

The applicants submit that the fact that their invention produces significant advantages over any prior art militates in favor of applicant's because it proves that even if there was a combination, it would produce new, synnergetical and unexpected results and, hence, would be unobvious.

The applicants therefore submit that combining Norichika, Sanberg and Gerrard is not legally justified and is, therefore, improper. Thus they submit that the rejection based on these references is also improper and should be withdrawn.

The applicants respectfully request, if the claims 6 and 14 are again rejected upon any combination of references, that the Examiner include an explanation, in accordance with M.P.E.P §706.02, Ex parte Clapp, 27 U.S.P.Q. 972 (P.O.B.A 1985), and Ex parte Levengood, supra, a "factual basis to support his conclusion that it would have been obvious" to make the combination or modification.

Horn et al (6,737,610) describes and electrical blanket (10) with heating element having safety sensor 36. The blanket is connected to a power control, having a safety visual indicator 34, which "provides a visual display that a fault has been detected in heating assembly 22" (col 4, Lines 60-65). The visual displays for indication of safety fault are parts of numerous safety control designs in different industries. Neither Horn, or applicants claim that they invented a safety visual control indicator. These indicators are optional, therefore they are described in a separate dependent claim of the applicants' invention.

The combination of proposed by the Office Action inventions of Norichika in view of Sandberg and further in view of Horn would not result, for the reasons described in the legal court cases, referenced above, in any kind of a usable heating system, having simultaneous hot spot and mechanical fault detection function.

The applicants submit that the fact that their invention produces significant advantages over any prior art militates in favor of applicant's because it proves that even if there was a combination, it would produce new and unexpected results and, hence, would be unobvious.

The applicants therefore submit that combining Norichika, Sanberg and Horn is not legally justified and is, therefore, improper. Thus they submit that the rejection based on these references is also improper and should be withdrawn.

The applicants respectfully request, if the claims 9 and 15 are again rejected upon any combination of references, that the Examiner includes an explanation, in accordance with M.P.E.P §706.02, Ex parte Clapp, 27 U.S.P.Q. 972 (P.O.B.A 1985), and Ex parte Levengood, supra, a "factual basis to support his conclusion that it would have been obvious" to make the combination or modification.

Chiles et al (6,300,598) describes the monitor (10) for use during installation of underfloor warming mat (52) to monitor the mechanical intrusion/fault in the heating elements. This is a simple modified electrical continuity monitor, which has a sound alarm 48 (col 4, lines 1-28). The sound alarms, which sound in the event of mechanical or electrical breakes, or short circuits are widely used in the industry. Neither Chiles, nor applicants claim the alarm as their invention. The sound alaram may be only optional, therefore it is described in a separate dependent claim of the applicants' invention.

The combination proposed by the Office Action inventions of Norichika in view of Sandberg and further in view of Chiles would not result, for the reasons described above in the legal court cases, in any kind of a usable heating element and simultaneous hot spot and mechanical fault detection device.

The applicants submit that the fact that their invention produces significant advantages over any prior art militates in favor of applicant's because it proves that even if there was a combination, it would produce new, synnergetical and unexpected results and, hence, would be unobvious.

The applicants therefore submit that combining Norichika, Sanberg and Chile is not legally justified and is, therefore, improper. Thus they submit that the rejection based on these references is also improper and should be withdrawn.

The applicants respectfully request, if the claims 10 and 16 are again rejected upon any combination of references, that the Examiner include an explanation, in accordance with M.P.E.P

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§706.02, Ex parte Clapp, 27 U.S.P.Q. 972 (P.O.B.A 1985), and Ex parte Levengood, supra, a "factual basis to support his conclusion that it would have been obvious" to make the combination or modification.

Conclusion.

For all of the above reasons, applicants submit that the specifications and the claims are in proper form, and that the claims all define patentability over the prior art. Therefore they submit that this application is now in condition for allowance, which action they respectfully solicit.

Conditional Request For Constructive Assistance

Applicants believe that claims of this application are proper, definite, and define novel structure which is also unobvious. If, for any reason, this application is not believed to be in full condition for allowance, applicants respectfully request the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P. § 706.03(d) and §707.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very truly yours,
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